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MIND IN ANIMALS

Mind in Animals. By Prof. Ludwig Büchner, author of "Force and Matter," &c. Translated, by the author's permission, from the German of the Third Revised Edition, by Annie Besant. (London: Free-thought Publishing Company, 1880.)

THE translation into English of Büchner's work on "Mind in Animals" (which was originally published in 1876) cannot but be welcome to persons of all shades of opinion, however greatly opinions may differ as to the auspices of the Company which has undertaken and published the translation. The Company, among other things, undertakes the translation of works from foreign languages in the form of a series entitled "The International Library of Science and Free-thought," and of this series Büchner's work on "Mind in Animals" constitutes the first member. It is to be hoped that the subsequent efforts of the Company in this direction will prove as useful and beneficial as the one we are about to consider. The translation has here, on the whole, been well done, although occasionally we meet with an awkwardness of construction which a little more care in re-casting the sentences might easily have obviated. The work itself is without question a highly valuable compilation of facts relating to Comparative Psychology, and therefore its translation into English supplies a fitting occasion for our endeavouring to recommend it to the notice of English readers.

Although the work is called "Mind in Animals," and fills between three and four hundred closely-printed pages, it only deals with the psychology of articulata, and even of this comparatively limited group it treats only of four orders, viz. the *Hymenoptera*, *Orthoptera*, *Arachnida*, and *Coleoptera*. No one, however, can read the work and feel that this limitation of its subject-matter is a defect, although in view of it the title might perhaps have been appropriately changed to "Mind in Insects."[1] As he says in his preface, "the author has not thought it necessary to widen the circle of his observations over the whole of the comparatively narrow and yet infinitely wide and rich sphere of intelligent insect life; he considers it better . . . to treat a single species thoroughly, rather than many species cursorily and superficially," &c. Such being the author's aim, he appears to have read most of the existing literature upon the subject that is worth reading, and then made a compilation, tolerably well sifted, of all the more important facts. These he has presented in a form at once highly entertaining to a general reader of the lowest intelligence, and most useful alike to the working naturalist and the evolutionary psychologist. The labour represented by the result is very considerable, and Büchner deserves all thanks and praise, both from the scientific and non-scientific public, for the patient industry with which, like the ant or the bee that he is so fond of upholding as a model, he has collected and arranged his materials.

More than three-fourths of the book is devoted to ants and bees, and this portion constitutes a compendium of facts regarding the psychology of these interesting animals which we do not hesitate to regard as the most instructive that has hitherto been made. There are however no original observations in the book—or rather no original observations recorded as made by Büchner himself, for there are several highly interesting observations recorded as made by friends and correspondents. Some of the more important of these we may here present.

Herr Lehr, a "bee-keeping friend of the author," noticed that when his bees were attacked by dysentery, and "no longer able to retain their excrements, one hive suffered less than the others." Investigation showed that the bees of this hive had made a drain from the upper part of the hive, "where they were accustomed to sit together during the winter," to the exterior.

The same (?) friend observed that when the wind blew down one of his hives and he replaced it, a few days later "the bees had left their old home in the lurch, and tried to enter other hives, clearly because they could no longer trust the weather, and feared that the terrible accident might again befall them."

Another friend, Herr Schlüter, saw a hornet catch a cicada, sting it, and try to fly off with the bulky prey. The hornet's strength not being sufficient to enable it to fly with the cicada from the ground, it dragged its burden up the stump of a mulberry-tree that stood close by. Arrived at the top of the stump—twelve feet from the ground—"it rested for a moment, grasped its victim firmly, and flew off with it to the prairies. That which it was unable to raise off the ground it could now carry easily once high in the air."

Again, Herr Merkel communicates the following. He saw a little grey wasp dragging a long caterpillar to its hole. Arrived there, it put one end of the caterpillar over the hole, "and went to the other end and lifted it up so high that the caterpillar fell in. But a piece of it stuck out"; so the wasp pulled it out, and, laying it down near the hole, "went in again and brought out several little stones of the size of small peas. It then again let the caterpillar fall into the hole in the way described." This time it was quite absorbed by the hole, and was buried by the wasp.

More interesting is an observation due to Herr Nottebohm, Inspector of Buildings at Karlsruhe, who carefully syringed off all the aphides from a weeping-ash in March, to the great benefit of the tree. But in June he was astonished to see multitudes of ants running up and down the trunk of the tree, busied in carrying up aphides all over the tree in order to re-stock it, and "after some weeks the evil was as great as ever."

Again Herr Theuerkauf showed Büchner a maple tree, round which he had "smeared about a foot-width of the ground with tar," in order to check the mischief caused by ants cultivating aphides. But the ants on the tre turned back on finding the tar, and "carried down aphides, which they stuck down on the tar one after another, until they had made a bridge over which they could cross the tar-ring without danger."

Highly interesting also is an observation communicated to the author by Herr Kreplin concerning the Ecitons crossing streams, which is even more wonderful than anything that has been related of these wonderful insects by Bates or Belt. "If no natural bridge is available for the passage, they travel along the bank of the river until they arrive at a flat sandy shore. Each ant now seizes a bit of dry wood, pulls it into the water, and mounts thereon. The hinder rows push the front ones even further out, holding on to the wood with their feet and to their comrades with their jaws. In a short time the water is covered with ants, and when the raft has grown too large to be held together by the small creatures' strength, a part breaks off and begins its journey across, while the ants left on the bank busily pull their bits of wood into the water and work at enlarging the ferry-boat until it again breaks. This is repeated as long as an ant remains on the shore."

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[1] The Arachnida are called by Büchner insects, in accordance with popular usage.

Similarly, Dr. Ellendorf informs the author that he has witnessed ants using a straw for a bridge across a saucer of water which he had placed as a barrier between the ants and his provisions. He then pushed the straw about an inch from one of its two landing-places. After much confusion and crossing of atennæ, the ants "soon found out where the fault lay, and with united forces they quickly pulled and pushed the straw until it again came into contact with the wood, when the communication was again restored."

The same observer communicates another very interesting observation on the leaf-cutting ants. He interrupted a marching column by placing a withered branch across their road. The loads were laid aside by more than a foot's length of the column, and the ants began on both sides of the branch to tunnel beneath it, and when the tunnel was completed "each ant took up its burden again, and the march was resumed in the most perfect order."

These being the most important additions which Prof. Büchner's work has made to our previous knowledge of insect psychology, we shall now proceed to make a few criticisms upon the work as a whole. In the first place, the author is not quite free from the failing common to less critical writers on animal intelligence, of admitting dubious cases without sufficient reserve. Thus, for instance, on no better authority than Plutarch, he gives (p. 57) a case "related by a certain Cleanthes," of ants going from one ant-heap to the entrance of another, carrying a dead ant. Other ants came out of the visited heap, consulted with the bearers of the body, went back again and brought a worm "out of the depths of the nest, which was evidently intended to serve as a ransom for the dead body. Then the ants which had brought the corpse left it lying there, and carried away the worm instead." He then adds, "However incredible this may sound, it is beyond doubt that ants and bees have been seen carrying away and even burying their dead, and of this further details will be given later." As the fact of "burying" is highly dubious, we looked forward from this statement to afterwards meeting with some new evidence upon the subject; but in the case of ants only found the unsupported assertion of Dupont, followed by a confusion of the well-ascertained fact that ants carry their dead away from their nests, with the inference that they bury them (p. 167), while in the case of bees we only met with (p. 249) a very flimsy anecdote, which we had previously read in Watson's "Reasoning Powers of Animals," quoted from the *Glasgow Herald* on the authority of an anonymous correspondent; it presents a pathetic account of two bees flying out of a hive "carrying between them the corpse of a dead comrade," till, after searching for a suitable hole, they "carefully pushed in the dead body, head foremost, and finally placed above it two small stones. They then watched for about a minute before they flew away"—no doubt, of course, performing some appropriate funeral service. And this is the evidence on which the earlier statement rests, "*it is beyond doubt* that ants and bees have been seen . . . burying their dead"! Such cases of careless judgment, however, in admitting alleged facts on wholly inadequate evidence, are fortunately in this work exceptional.

Another point on which criticism has to be offered is the frequent failure of references. Important facts are constantly stated without any information being supplied as to the authority on which the statements rest. Again, even when the authority is stated, after the first time of quoting the reference is always to *loc. cit.*, so that unless the name of the work is carried in the reader's memory, he has to hunt back through an indefinite number of pages of letterpress till he finds it.

Another feature of the work which must be considered a blemish upon it as a work of science, is a perpetual breaking out of allusions to matters religious and political. The strong bias which the author displays in these digressions, apart from being singularly out of place in a treatise which aims at scientific method, constantly leads him into obvious fallacies. For instance, when speaking of ants, he asks, "Why should we take it for granted that in a perfectly free community men would only work if compelled, when these animals give proof that such a free commonwealth is very possible, and is compatible with the voluntary work of all?" Certainly any one who is disposed to take such a supposition for granted, would scarcely be convinced by such a false analogy as that between an ant and a man; and he might very easily show up the nonsense by replying, "Why should we take it for granted that men in a perfectly free community *would* work without compulsion, when the grasshoppers give proof that such a free commonwealth is very possible, and is compatible with no work at all?" Such is the logic of many of these passages, and we do not think that in others of the same kind the sentiments are much more fortunate. It is, for instance, to be doubted whether the following picture of "the widest Socialism and Communism" as revealed in bees, and held out as an example for humanity to imitate, will prove as attractive to the eyes of all his readers as it evidently appears to the eyes of the writer. "They have no private property, no family, no private dwelling, but hang in thick clumps within the common-room in the narrow space between the combs, taking turns for brief nightly repose" (p. 266). On all such matters opinions may legitimately vary; but allusions to them are, as we have said, out of place in a treatise on Comparative Psychology.

Coming next to criticisms of a more purely scientific character, we have first to notice a meagreness with which the whole subject of instinct is treated. In his anxiety to combat the supernaturalists, Büchner errs on the side of too closely assimilating the psychological faculties of insects with those of men. That is to say, he endeavours to explain most, if not all, instinctive action as being one with "reason" and "reflection." But it is an enormous and damaging mistake in the cause of evolution to disparage the distinction which unquestionably exists between mind in animals and mind in man. The function of an historical psychologist is to explain the origin of instincts and the development of rational thought—not to slur the two together as presenting but little difference to be explained. Yet in two chapters devoted to instincts we have in this treatise scarcely a word to explain their probable mode of origin, and nothing to show how they may be supposed to have developed into reason. This "inverted anthropomorphism" constantly leads the author into statements which are little less than absurd—as, for instance, when speaking of the wedding-flights of bees he observes that their leaving the hive to copulate in the air "seems as though a feeling of modesty prevented the queen from performing this act before the eyes of the crowd."

Again, even in the few places where he does touch upon the origin of instincts, his treatment of the subject is most unsatisfactory. Taking, for example, his remarks on the difficulty presented by the case of neuter insects being derived from parents which display totally different instincts from their progeny, he adopts the view that fertile females were originally workers, lost their working instincts by degrees, but now leave them as perpetual legacies to their barren offspring. Now, although this view may be taken as a mitigation of the difficulty, it certainly cannot be taken as a full "answer" to it. Büchner very lightly passes round a mountain of trouble where he says, "that this opinion, if correct, would also apply to the other social insects, and especially to ants, scarcely requires special argument." This is a most astonishingly complacent way of eluding what Darwin calls "the climax of difficulty" which is presented by several castes of workers having instincts differing, not only from their fertile parents, but from one another. The truth is that the theory advanced by Büchner is alone clearly inadequate to meet the facts; and he does not appear even to have read, or else to have entirely forgotten, the gem of condensed and candid reasoning upon this subject by which the beautiful theory concerning it is rendered in the "Origin of Species."

Lastly, even as to matters of fact there are some criticisms to be made. A serious sin of omission is to be complained of in the description of the habits of the leaf-cutting ants, in that no allusion is made to the theory of Bates—which having been since supported both by Belt and Müller, deserves to be regarded as highly probable, if not virtually established—concerning the object with which the leaves are cut and garnered, namely, to grow fungi upon. Again, in dealing with the so-called agricultural ant the author is, we think, somewhat too definite in his statements as to these insects planting seed. So far the remarkable story on this head rests on the unsupported authority of Dr. Lincecum (not Linecum, as repeatedly misprinted), and although it may prove true, ought not, until amply corroborated, to be thus unreservedly accepted.

Other criticisms of the same kind might be passed, and we cannot help feeling it would have been well to have added a short chapter to the translation bringing the literature of the subject up to date, and likewise an index; but enough has been said to signify our general estimate of the work. In all matters of fact it is, as a rule, most accurate and comprehensive. In its philosophy it is not strong. But as a whole it is a decidedly valuable addition to the literature of Comparative Psychology.

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AMERICAN INDIAN LANGUAGES

Introduction to the Study of Indian Languages. By J. W. Powell. Second Edition. (Washington: Government Printing Office, 1880.)

THIS is one of the most useful of the many useful works issued under Mr. Powell's able management by the ethnological bureau of the Smithsonian Institution. It was originally published in 1877, and it is satisfactory to find that another edition has so soon been called for. At the same time one cannot but regret that this opportunity was not taken to somewhat modify the title, which, as it stands, is apt to deceive the unwary. The book is in no sense an abstract treatise on the nature, structure, or classification of the American languages, either regarded independently or in relation to other forms of speech. It has nothing to do with the philosophy, or even with the grammar of these idioms taken collectively or individually. Its object, if less ambitious, is perhaps far more useful in the present state of these studies. American philologists have confessedly shown a disposition to dogmatise on the morphology of the native idioms, and have indulged in some very wild speculation on utterly insufficient data regarding their origin, development, and affinities. The old school of etymologists, who held that Eliot's Massachusetts Bible was merely a thinly disguised form of Welsh, that Delaware and Lapp were first cousins, and that Basque sailors stranded on the Brazilian seaboard could hold converse with the Tupinambas and other Guarani peoples of that region, has had its day. But it has been succeeded by another, which, if slightly more cautious, is scarcely less extravagant, and which, notwithstanding the warning voice of science, still flourishes in both hemispheres. It will suffice here to refer to the astonishing theories seriously advocated by the late Abbé Brasseur de Bourbourg on the relations of the Maya-Quiché and Aryan families, by the Abbé Petitot on the Athabascan and Chinese, and quite recently by Mr. John Campbell of Montreal on "The Hittites in America." "The Aleutans and Barabra," writes the last-mentioned authority, "agree in being worshippers of the sun like other Hittites, in the manufacture of red waterproof leather, and in their manner of adorning the head. . . . Physical ethnology would never have dreamt of uniting white Basques and Circassians, black Nubians, yellow Japanese, and red American Indians; but philology, which knows no colour but that of words and constructions, makes them one. It may be that in the Barabra we shall yet find the purest surviving form of the ancient Hittite language. Some of its numerals help to connect those of the Peruvian dialects with other Hittite forms." One thing more surprising perhaps than such insanities is their appearance in the pages of a professedly scientific journal (*The Canadian Naturalist and Quarterly Journal of Science* for August, 1880, p. 359).

A wholesome check to writers inclined to indulge in tendencies of this sort is afforded by the modest and unpretending character of the work under consideration. It is put forward simply as a guide and aid to students in the collection of linguistic materials in a very wide field, where the labourers are still too few for the urgent and extensive character of the work to be performed. It thus brings us back to the domain of hard facts, wisely